BIOLOGICAL EVALUATION OF BARK BEETLE INFESTATIONS ON THE OCONEE NATIONAL FOREST, PIEDMONT NATIONAL WILDLIFE REFUGE, AND HITCHITI EXPERIMENTAL FOREST IN GEORGIA

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ABSTRACT

Southern pine beetle (SPB) (Dendroctonus frontalis, Zimm.) activity is increasing on the Oconee National Forest, Piedmont National Wildlife Refuge, and Hitchiti Experimental Forest. Results of a partial aerial survey of 300,100 acres indicated 38 spots of dead and dying pines. Susceptible host type covers 106,000 acres (.35 aerially-detected spots per thousand acres of host type).

INTRODUCTION

On July 22, 1982, an aerial survey was conducted by personnel from the Oconee National Forest and Forest Pest Management Aerial Survey Team on the Oconee National Forest, Piedmont National Wildlife Refuge, and Hitchiti Experimental Forest (Bassett, 1982).

In the past 20 years, these areas have experienced 4 SPB epidemics. The first peaked in 1963 and collapsed during the winter of 1964 (Cambre and Padgett, 1964). In 1968, activity again increased, but rapidly subsided (Barry et al., 1968). Three years later, in 1971, high population levels were again reported (Barry et al, 1971). This epidemic prevailed until 1974 (Barber, 1975). In 1979, SPB populations exploded (Hoffard et al., 1979). This epidemic, the worst in recent history, had collapsed by 1981 (Hoffard and Lambert, 1981). Traditionally, infestations have been most severe in and around the Cedar Creek Wildlife Management Area, where Jones, Putnam, and Jasper Counties intersect (Fig. 1). Severity of infestations at this location may be associated with a high incidence of littleleaf disease (Phytopthora cinnamomi) of shortleaf pine (Pinus echinata).

This evaluation was conducted to determine the present status and trend of southern pine bark beetle infestations on the areas involved, and to recommend appropriate pest management strategies.

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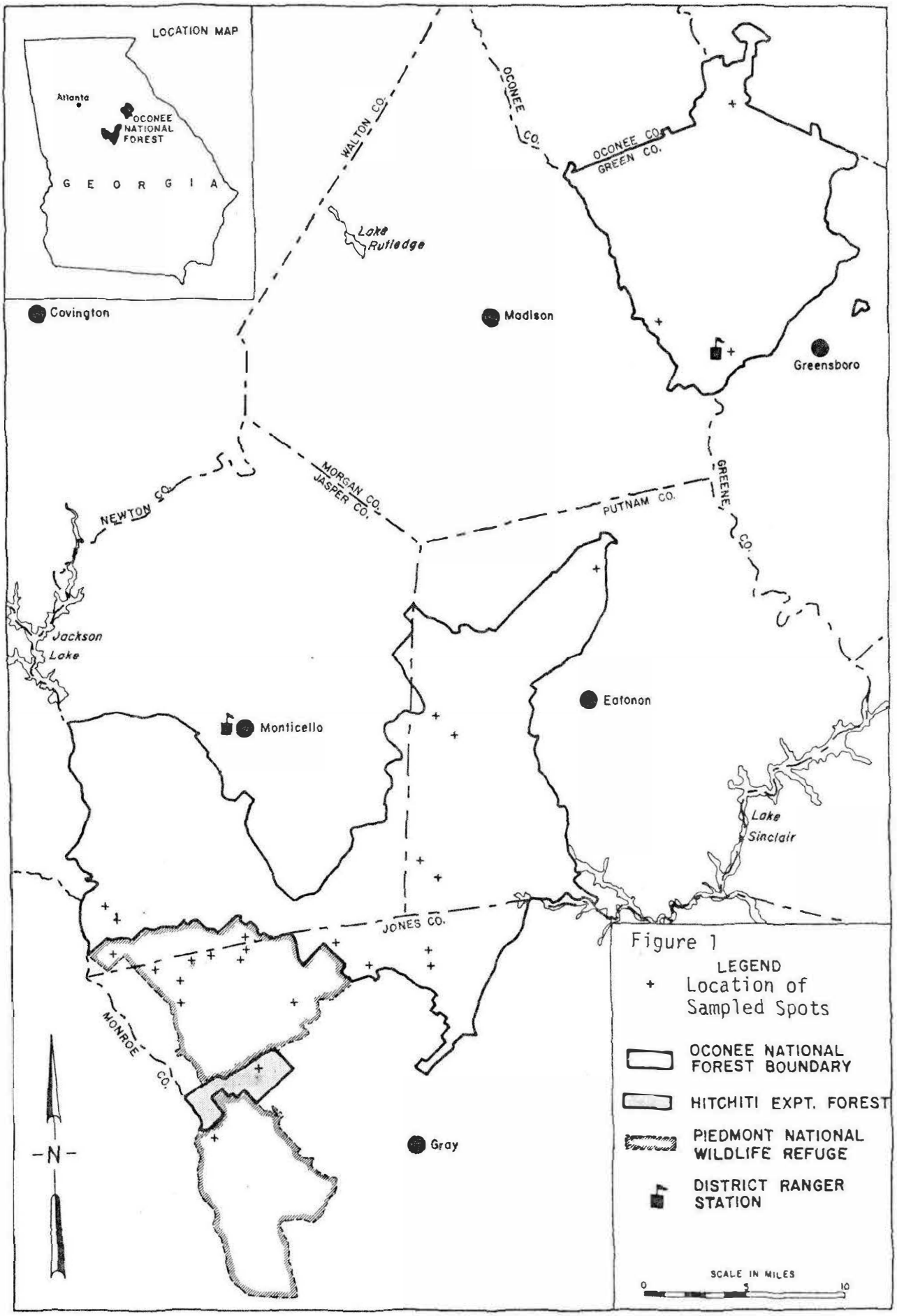

LOCATION MAP
Atlanta
OCONEE NATIONAL FOREST
G E O R G I A
WALTON CO.
OCONEE CO.
OCONEE CO.
GREEN CO.
Lake Rutledge
Covington
Madison
Greensboro
NEWTON CO.
MORGAN CO.
JASPER CO.
PUTNAM CO.
GREENE CO.
Jackson Lake
Monticello
Eatonon
Lake Sinclair
JONES CO.
MONROE CO.
Gray
-N-
Figure 1
LEGEND
Location of Sampled Spots
OCONEE NATIONAL FOREST BOUNDARY
HITCHITI EXPT. FOREST
PIEDMONT NATIONAL WILDLIFE REFUGE
DISTRICT RANGER STATION
SCALE IN MILES
0
5
10

METHODS

Standard aerial sketch-mapping techniques were used to conduct the survey. Two observers, viewing a strip .5 miles wide, observed and plotted suspected spots on Class A Ranger District Maps. On the Oconee National Forest, flight lines were spaced two miles apart, resulting in a 50 percent survey. Flight lines on the Piedmont National Wildlife Refuge and Hitchiti Experimental Forest were spaced one mile apart, giving 100 percent survey coverage.

On the Oconee National Forest and Hitchiti Experimental Forest, 15 spots detected during the aerial survey were sampled. Sample selections were made proportionate to spot size (number of trees observed) distribution. After locating sample spots, the causal agent was identified and the following data were collected: number of vacated and infested trees by crown color (i.e., green, fading, red, or black), basal area, average diameter, and average total height. The same data were collected on nine spots observed during the survey of the Piedmont National Wildlife Refuge. One aerially-detected spot was not found, but two additional spots that were undetected during the survey were also sampled. The presence and status of natural parasites and predators of southern pine bark beetles was noted. The data collected were used to project population trends based, in part, on the ratio of green infested to red infested trees.

RESULTS

A total of 38 spots of dead and dying pines were observed during the aerial survey for all administrative units combined (Fig. 1). Table 1 shows a summary by size class category and administrative unit. Table 2 shows results of the ground survey of 26 sampled spots.

The sampled spots showed a total of 5,324 ft^3 killed by SPB. When the data are doubled for the Oconee's 50 percent survey, the figure becomes 10,246 ft^3. Six of the 26 spots were Ips infestations, and these accounted for a relatively small proportion (less than 6%) of the total volume.

This survey indicates moderate populations of the SPB. Timber currently infested by the SPB constitutes 38.6 percent of the killed volume in sampled Oconee and Hitchiti stands (Fig. 2). On the Piedmont National Wildlife Refuge, the figure is substantially lower, with only 11.1 percent infested with SPB. Nevertheless, the potential for rapid buildup is high, particularly in southern sections of the Oconee and Hitchiti, where littleleaf disease-stressed timber and a high ratio of green infested to red trees indicates potential for rapid population buildup.

Many of the spots were of lightning strike origin. The area has seen an inordinately high incidence of electrical storms this summer (personal communication with Oconee District Ranger, John Moore).

Despite the surge of relatively new activity, a relatively high level of activity by natural enemies of the SPB was noted. This is especially true for the predators Thanasimus dubius and ~~Scolopsis mississippiensis~~ Scotoposcelis.

Table 1.--Summary of aerial survey data, Oconee National Forest, 7/22/82.

Ownership:	Infestation Size (# trees)									
	3 - 5		6 - 20		21 - 50		50+		Total	
Federal	Spots	Trees	Spots	Trees	Spots	Trees	Spots	Trees	Spots	Trees
Oconee NF	13	42	11	130	2	80	0	0	26	252
Piedmont NWR	2	10	7	100	1	30	0	0	10	140
Hitchiti Exp. For.	1	5	1	10	0	0	0	0	2	15
Total	16	57	19	240	3	110	0	0	38	407

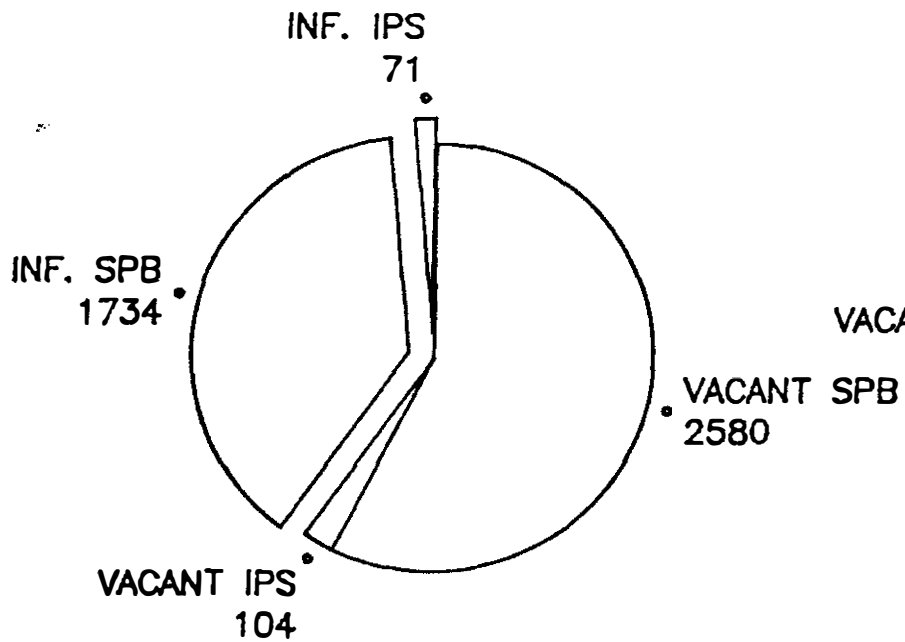
Table 2.--Ground check data from Oconee NF, Hitchiti Experimental Forest, and Piedmont National Wildlife Refuge.

Spot #	Aerial size	Vacated		Infested			% Infested	Green:Red 1/ Ratio	Basal Area	$\bar{x}$ d.b.h./$\bar{x}$ Ht.
		Red	Total	Red	Green	Total				
OCONEE AND HITCHITI SPOTS										
SPB 1	20	11	12	2	7	9	42.9	3.5:1	210	11.0/69
SPB 2	30	10	17	0	31	31	64.6	-	150	8.5/59
IPS 3	5	10	10	0	2	2	16.7	-	180	7.0/52
IPS 4	10	0	2	2	1	3	60.0	1:2	90	11.9/70
SPB * 5	5	2	4	0	0	0	0	-	110	11.5/73
SPB 6	30	2	4	11	6	17	80.9	1:3.8	100	10.9/65
SPB 7	20	6	7	1	0	1	12.5	-	70	10.0/67
IPS * 8	3	3	3	0	0	0	0	-	80	12.5/77
SPB * 9	3	3	3	0	0	0	0	-	40	14.0/80
SPB 10	20	40	46	0	15	15	24.6	-	110	12.5/65
SPB *11	10	3	4	0	0	0	0	-	130	8.4/57
SPB 12	5	2	2	0	2	2	50.0	-	130	15.2/85
SPB 13	5	2	2	1	0	1	33.3	-	40	14.3/64
SPB 14	5	2	3	1	10	11	78.6	10:1	150	15.5/76
SPB 15	20	2	4	0	20	20	83.3	-	110	12.8/75
PIEDMONT SPOTS										
IPS * 1	5	1	2	0	0	0	0	-	70	9.4/45
SPB * 2	10	12	15	0	0	0	0	-	80	9.7/40
SPB 3	5	24	28	0	1	1	3.4	-	80	10.0/54
SPB * 4	10	2	7	0	0	0	0	-	50	19.8/48
IPS * 5	5	5	6	0	0	0	0	-	110	8.4/38
SPB 6	2	1	1	0	1	1	50.0	-	30	13.8/58
SPB 7	10	7	7	1	1	2	22.2	1:1	120	13.7/56
SPB 8	1	0	0	1	1	2	100.0	1:1	60	13.3/62
IPS 9	2	2	2	0	1	1	33.3	-	50	19.7/73
SPB *10	3	7	7	0	0	0	0	-	90	8.1/53
SPB 11	2	1	1	1	0	1	50.0	-	70	16.8/70

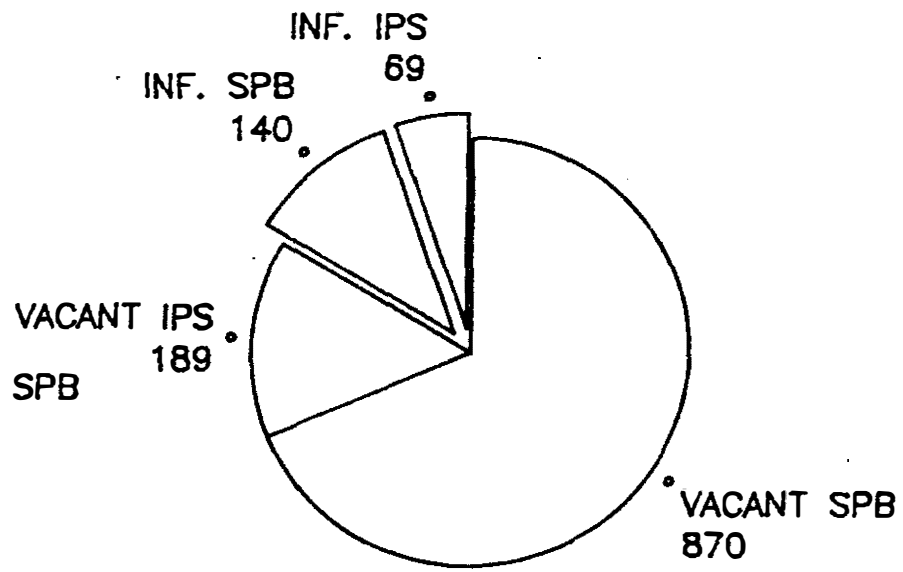
1/ Based on infested trees only.

* Inactive.

FIG. 2 — — SAMPLED AFFECTED TIMBER BY CONDITION (CUBIC FEET), 8/1/82



OCONEE N.F. AND HITCHITI EXPERIMENTAL FOREST



PIEDMONT NATIONAL WILDLIFE REFUGE

Current SPB activity is insufficient to merit a special suppression project. Nevertheless, Forest Pest Management will continue to maintain contact and recommend continued aerial surveys and ground checks as needed.

For recommended controls, refer to the section "CURRENT SUPPRESSION PROCEDURES."

CURRENT SUPPRESSION PROCEDURES

1. Removal of Infested Trees by Commercial Sale. When infested trees of merchantable size are accessible, they should be removed by commercial sale. Logging of the infested material should begin immediately. Contract time limits should insure rapid removal.

When practical, and if host type is present, a 40- to 70-foot buffer strip should be marked and cut adjacent to and ahead of the most recently infested trees. This practice is effective in reducing the possibility of "breakouts." When only a small volume of infested, merchantable material occurs in a spot, noninfested trees surrounding the spot may be marked to provide an operable cut.

The order of priority of removing beetle-infested timber from a spot should be as follows:

-- Trees in the buffer zone at the head(s) of the spot; if not removed within two weeks of marking, another visit and talley must be made in order to insure removal of all infested trees and an adequate buffer strip.

-- Trees with fresh attacks and having young broods (usually the green, recently infested trees).

-- Trees having nearly developed broods (usually the red and fading trees).

Remove infested trees from National Forest lands by commercial sale or administrative procedures in accordance with guidelines and procedures set forth in FSM 2400 through 2490.

2. Piling and Burning. Unmerchantable or inaccessible SPB infestations can be suppressed by cutting, piling, and thoroughly burning the bark of infested trees. The entire bark surface must be thoroughly burned to insure effective control. The order of priority for cutting, piling, and burning infested trees, particularly the large spots, is the same as paragraph (1) under "Removal of Infested Trees by Commercial Sale." Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts," every effort should be made to locate and treat all green infested trees during the piling and burning operation.

3. Chemical Control. One chemical formulation recommended for SPB control is a one-half percent lindane spray, with water as the carrier. This may be formulated from a 20 percent lindane emulsifiable concentrate at the rate of 11 pints of concentrate in enough water to make 55 gallons of spray. (Ratio of one part 20 percent lindane EC to 39 parts water).

Dursban® (chlorpyrifos) is also registered for SPB control. It is available as a liquid, containing 4 pounds of insecticide per gallon of concentrate. The spray is prepared by mixing 2-2/3 fluid ounces of concentrate with water to make 1 gallon or 2.1 gallons of concentrate in 100 gallons of water. Dursban®, a restricted-use pesticide, is to be applied only by or under the supervision of a certified pest control operator or other trained personnel responsible for insect control programs.

Cut, limb, and buck all infested trees into workable lengths. Spray the infested bark surface to the point of runoff. A compressed air sprayer (3-gallon capacity or equivalent) is an ideal applicator. Infested logs must be turned two or three times to insure complete treatment of infested bark. Spray stumps and bark removed by woodpeckers. Low pressure sprayers may be used to treat large, accessible infestations.

The order of priority for cutting and spraying infested trees in large spots is the same as paragraph (1) under "Removal of Infested Trees by Commercial Sale." Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts," every effort should be made to locate and treat all green infested trees during the chemical control operation.

Never spray trees from which SPB brood has emerged. Natural enemies of the SPB in these trees can then complete their development.

Instructions for minimizing the adverse effects of mixing, transporting, and storing pesticides, applying pesticides, and disposing of pesticide containers and excess chemicals are outlined in Section 8.3 of the Forest Service Health and Safety Code FSM 5242.21.

4. Cut-and-leave. This control tactic reduces losses from spot growth and proliferation during the summer months. Cut-and-leave is designed to disrupt spot growth in small to medium-sized spots (40 active trees) by dispersing emerging beetles. These spots can be salvaged when markets or weather permit. Trees are still suitable for sale months after felling.

The following procedure is to be followed when using cut-and-leave:

(1) Identify all active trees within the spot.

(2) Fell all active trees toward the center of the spot.

(3) Fell a horseshoe-shaped buffer of green, uninfested trees around the most recently attacked trees at the head of the spot and leave them lying on the ground with crowns pointed toward the center of the spot. The buffer should be as wide as the average height of the trees in the stand.

Cut-and-leave treatments should only be applied during the summer months between June and October. Spots with 10 or more infested trees should be treated first. As time permits, spots with less than 10 infested trees should also be treated if they contain trees with fresh attacks. In these smaller infestations where a specific head is not distinguishable, an adequate buffer strip (equivalent to the average height of the stand) and all infested and green, uninfested trees within the spot should be felled.

Re-examination of Treated Areas. Re-examine areas where infested trees were removed by commercial sales, piled and burned, chemically treated, or cut and left within 2 or 3 weeks after treatment to check for additional infested trees. If additional trees are found, treat them.

In any area where infested trees are cut for chemical control or piling and burning, or removed through commercial sales and administrative use procedures, stumps adjacent to living pine trees should be treated to control or prevent the root rot Fomes annosus.

In stands that have been previously thinned or have had a history of F. annosus infection, the stumps should be treated with the competing fungus, Phlebia gigantea.

In stands that have no history of F. annosus and have never been thinned, the stumps should be treated with borax.

Southern pine beetle infested tree stumps cut during the period of May through August, and below 34°N latitude, do not have to be treated with either of the above materials. This is because few spores are formed during this period and high temperatures often kill spores that are produced. However, routine summer thinning in areas of SPB buildup is not recommended.

PREVENTIVE MEASURES

The preceeding represents only short-term, immediate control strategies. Preventive measures form an important part of the integrated pest management process. Some of the more significant preventive measures include:

1. Preventing or minimizing littleleaf disease, a condition which predisposes these weakened trees to beetle attack. Depending on severity of infection, diseased trees may be removed during normal thinnings on a 6-year cutting cycle or as soon as merchantable. In high-hazard areas or when replanting known littleleaf sites, use loblolly pine or a more resistant tree species, as opposed to shortleaf pine.

2. Harvesting mature and overmature stands. Such stands are vulnerable to beetle attack and should be harvested as soon as possible.

3. Thinning stagnated stands. Overstocked stands are low in vigor and are more likely to be attacked. They should be thinned to a point that trees again show thrift and vigor.

4. Minimizing impact of natural disturbances which causes stand stress. These factors include ice, wind, hail, animal damage, flooding, erosion, poor soil fertility, etc. Corrective measures include removal of individually damaged trees, wholesale salvage, improving drainage, fertilization, etc.

5. Minimizing or eliminating man-caused disturbances. Logging, pipeline, sewerline, and powerline construction, or other construction activities require use of heavy equipment, which causes tree skinning and soil compaction and significantly weakens trees. Efforts to minimize the damaging consequences of these activities can significantly reduce the possibility of their leading to SPB problems.

PRECAUTIONARY PESTICIDE USE STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key--out of the reach of children and animals--away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registration of pesticides are under constant review by the U.S. Department of Agriculture, consult your county agricultural agent or state extension specialist to be sure the intended use is still registered.

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